BRITISH COLUMBIA DEPARTMENT OF MINES
HON. E. C. CARSON, *Minister* JOHN F. WALKER, *Deputy Minister*

BULLETIN No. 20—PART II.

LODE-GOLD DEPOSITS

South-eastern British Columbia

by

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PREFACE.

Bulletin 20, designed for the use of those interested in the discovery of gold-bearing lode deposits, is being published as a series of separate parts. Part I. is to contain information about lode-gold production in British Columbia as a whole, and will be accompanied by a map on which the generalized geology of the Province is represented. The approximate total production of each lode-gold mining centre, exclusive of by-product gold, is also indicated on the map. Each of the other parts deals with a major subdivision of the Province, giving information about the geology, gold-bearing lode deposits, and lode-gold production of areas within the particular subdivision. In all, seven parts are proposed:—

PART I.—General *re* Lode-gold Production in British Columbia.
PART II.—South-eastern British Columbia.
PART III.—Central Southern British Columbia.
PART IV.—South-western British Columbia, exclusive of Vancouver Island.
PART V.—Vancouver Island.
PART VI.—North-eastern British Columbia, including the Cariboo and Hobson Creek Areas.
PART VII.—North-western British Columbia.

By kind permission of Professor H. C. Gunning, Department of Geology, University of British Columbia, his compilation of the geology of British Columbia has been followed in the generalized geology represented on the map accompanying Part I. Professor Gunning's map was published in "The Miner," Vancouver, B.C., June–July, 1943, and in "The Northern Miner," Toronto, Ont., December 16th, 1943.

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SOUTH-EASTERN BRITISH COLUMBIA.

INTRODUCTION.

South-eastern British Columbia for the purpose of this publication consists of the whole of Golden, Revelstoke, Lardeau, Slocan, Ainsworth, Fort Steele, and Nelson Mining Divisions, and of Trail Creek Mining Division except for a small area east of Paulson which is treated in Part III.—Central Southern British Columbia.

In the period from 1900 to 1943, inclusive, South-eastern British Columbia is credited with a total recovery of 3,860,000 oz. of gold from lode deposits out of a total of 11,323,000 oz. for the Province. Trail Creek Mining Division produced 2,603,900 oz., of which more than 98 per cent. came from mines in the Rossland camp, which also produced important quantities of silver and copper. The adjoining Nelson Mining Division is credited with a recovery of 1,220,000 oz. of gold, more than 99 per cent. of which was from ore valued primarily for its gold content.

Production of gold from lode deposits of other mining divisions in South-eastern British Columbia amounted to less than 38,000 oz., of which slightly more than half came from Lardeau Mining Division. Deposits valued principally for their gold content have been mined in Lardeau and Slocan Mining Divisions, but a considerable part of the lode gold from these mining divisions and most of the lode gold from the Golden and Fort Steele Mining Divisions was recovered as a by-product in the mining of silver-lead-zinc ores.

The following notes are based on studies of various publications, principally those of the British Columbia Department of Mines and of the Geological Survey of Canada. Some general information for each mining division is given under the name of the division. For several mining divisions notes regarding lode-gold camps within the division follow the general information. The figures after the name of a camp indicate the latitude and longitude of the south-eastern corner of the one-degree quadrilateral, and the letters indicate the quadrant of the quadrilateral in which the camp lies. At the end of each section a list of references is given. Those interested in a particular area would be well advised to consult the Annual Reports of the Minister of Mines for information about properties, and to study the maps and reports dealing with the area.

TRAIL CREEK MINING DIVISION.

INTRODUCTION.

The mines centring in the city of Rossland have produced almost 99 per cent. of the total gold production of the Trail Creek Mining Division. The Rossland camp, from an area about 1 mile long and ½ mile wide, has produced more than 2,900,000 oz. of gold and substantial quantities of silver and copper, much more gold than has been produced by any other camp in the Province.

The other camps of the Trail Creek Mining Division—O.K. Mountain, 1½ miles south-west of Rossland; the Velvet-Portland, 6 miles south-west of Rossland; and near Paulson, 12 miles north-west of Rossland—were all discovered in the '90's and have yielded about 50,000 oz. of gold since that time

Gold-bearing veins east of Paulson in the Trail Creek Mining Division and deposits in the Burnt Basin camp, west of Paulson, in the Greenwood Mining Division, are the subject of a note in Part III.—Central Southern British Columbia.

ROSSLAND CAMP (49° 117° S.W.).

History.—The discovery of the lead-silver ores of Ainsworth on Kootenay Lake in 1883 and of the silver-copper lode of the *Silver King* near Nelson in 1886 attracted prospectors to the West Kootenay area and by the early '90's the gold lodes of the Rossland camp had been discovered and staked. It was not until the completion of rail communications with Trail and Spokane in 1895 and 1896, however, that major operations at Rossland commenced. By 1902 that camp attained its peak production of 126,000 oz. of gold, 373,000 oz. of silver, and 11,667 lb. of copper from about 330,000 tons of ore. From that time till 1916 the annual production of gold remained between 94,000 and 145,000 oz. After 1917, shortages in supplies and then decline in ore reserves brought about a very marked drop in annual output, which by 1923 had fallen to less than 7,000 oz. of gold. All but a small part of the ore was smelted directly, most of it at Trail, although for a few years some ore was smelted at Northport, Washington. In 1924 the Consolidated Mining and Smelting Company, which by that time had assumed control of all of the larger mines, attempted concentrating the ores before smelting, but the experiment was not continued. Mining ore at a reduced rate and exploration continued till about 1928. In the early '30's the Consolidated Mining and Smelting Company leased parts of its holdings to individuals or groups of miners and this move, coupled with the rise in the price of gold, led to an increase in production to over 25,000 oz. of gold in 1934, obtained from ore in surface exposures, in the upper workings of the old mines, and in the old dumps. This ore was smelted in one of the lead-furnaces at Trail, some of it after successful concentration in the company's mill. In the late '30's all the lead-furnaces were required for lead-smelting; the Rossland production had therefore to be reduced, and from 1936 to 1939 averaged about 9,000 oz. of gold annually.

Economic Geology.—The oldest rocks of the Rossland camp are sediments and pyroclastics of Palæozoic age. These have been extensively intruded by sills of dark grey to greenish-black augite porphyry, by granodiorite with offshoots of diorite porphyry, and by an irregular mass of monzonite. The gold ores, which contain subordinate values in copper and silver, occur in replacement veins along fissures or shears, cutting the intrusive rocks and having a general easterly strike and a high northward dip. Smaller amounts of gold ore occur in fractures meeting these veins at high angles. The main veins are, in general, confined to the brittle competent intrusive rocks. Shears in the incompetent sediments and schistose rocks were apparently unfavourable for the deposition of ores. The veins generally follow the contacts between the augite porphyry and any one of the other intrusive rocks. Some of the veins are very persistent, extending for as much as 4,000 feet along the strike and mining has been carried on down their dips to more than 1,500 feet below the surface. They are, however, commonly offset by faults, some of which are occupied by later lamprophyre dykes. The vein-widths vary from a few inches to a maximum of 130 feet. Within the veins there are ore-shoots from 50 to over 500 feet long, from a few feet to 130 feet wide, and as much as 750 feet in pitch length. These shoots pitch steeply, either to the east or west. Some are developed along the foot-walls of cross-cutting dykes, others along the intersections with mineralized cross-fractures. Some wall-rocks, notably the more sodic diorite, were apparently more favourable for replacement than others, and in these the ore-bodies are wider and richer than elsewhere. Mineralization consists of pyrrhotite and chalcopyrite with smaller amounts of pyrite, arsenopyrite, and molybdenite in a gangue of altered wall-rock and quartz. In the southern part of the camp galena and sphalerite are present in significant amounts. In places the ores may be almost solid sulphide, elsewhere rich gold ore may be nearly barren of sulphides. Wall-rock alteration includes the development of aggregates and grains of quartz, together with biotite, hornblende, and, less commonly, pyroxene. Surface oxidation does not continue to depths of more than a few feet, except along major fissures.

O.K. MOUNTAIN (49° 117° S.W.).

The gold ores of O.K. Mountain, 1½ miles south-west of Rossland, occur in quartz-filled fractures cutting altered basic and andesitic volcanics overlying a body of serpentine. All the gold production has been from veins not more than 1,000 feet from the serpentine. The veins, which are up to 2 feet wide, strike easterly and dip at moderate to steep angles southward towards the serpentine. At the serpentine contact, however, they invariably die out. Ore-shoots consist of parts of the veins which are richer, but not necessarily wider, than elsewhere, and in some cases ore-shoots occur where veins and cross-fractures intersect. The veins are composed of quartz with minor amounts of pyrite, chalcopyrite, and galena. Production to 1943 amounted to 30,000 oz. of gold, mainly from the *I.X.L.* and *Midnight* mines, from a little more than 8,000 tons of ore.

VELVET-PORTLAND (49° 117° S.W.).

The gold ores of the *Velvet-Portland* mine, 6 miles south-west of Rossland, occur in northerly-trending replacement veins dipping steeply to the west and cutting altered volcanics. Ore-shoots occur at the intersections of the veins with crosscutting dykes or faults. Mineralization includes copper and iron sulphides, and molybdenite in a gangue of altered wall-rock and quartz. Production to 1943 has amounted to 17,000 oz. of gold from about 58,000 tons of ore.

MISCELLANEOUS.

Outside of the above-mentioned camps, gold production from the Trail Creek Mining Division has been negligible. A few ounces of gold have been produced from the *Mighty Midas* property at Violin Lake, 6 miles south-east of Rossland, and a few ounces have been recovered as a by-product of copper and silver production from the *Mountain Chief* mine near Renata on Arrow Lake.

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Annual Reports of the Minister of Mines, B.C.

NELSON MINING DIVISION.

History.—During the latter part of the last century placer gold was recovered from several streams in the Nelson Mining Division. In 1886 the *Silver King* mine, a silver-copper lode deposit situated a few miles south of Nelson, was staked. The construction of the Nelson and Fort Shepherd Railway in 1893 made the area more accessible, and when the boom in the near-by Rossland camp had subsided intensive prospecting for lode deposits was carried on. In the period from 1896 to the turn of the century most of the deposits which became the larger gold producers were discovered. From 1890 to 1916 mining yielded a total of about 350,000 oz. of gold. At that time much of the gold was recovered by amalgamation, and difficulties were encountered once the oxidized ores of the upper parts of the veins were exhausted; a large number of the veins that were

again to prove profitable were then abandoned. During the First Great War many of the mines were closed because of rising costs. For the following ten years there was little gold-mining activity, except at a few properties from which siliceous ores, desired as flux, were shipped to the smelter at Trail at favourable treatment rates. Interest in lode-gold mining increased from 1926 onward and from 1932 to 1938 production grew steadily, reaching a total of 332,000 tons, yielding almost 125,000 oz. of gold in 1938. Approaching exhaustion of some of the deposits brought a reduction of output in 1939 and the difficulties of operating under war conditions have reduced the output still further. A feature of the revival of lode-gold mining was a general improvement in milling, the mills being of larger average capacity than in the earlier period, having superior grinding equipment, and using cyanidation or cyanidation with flotation instead of cyanidation as an adjunct of amalgamation. In this revival Sheep Creek, Ymir, and Erie Creek again became important lode-gold camps, and production was begun at the *Bayonne* and *Alpine* properties in sections from which there had not previously been important production.

Economic Geology.—In the Nelson Mining Division gold mineralization is more widespread than in any other part of the Kootenays. An area 10 to 20 miles wide, extending from the Kootenay River at Nelson southward for about 40 miles to the International Boundary, contains between 100 and 150 deposits from which gold has been produced. Virtually all this production has been from quartz veins of varying habits and relationships. Within the area, however, there are several clusters or concentrations of gold deposits, in each of which the gold deposits show certain similarities to one another. General descriptions of the deposits in these different clusters are given below. The Ymir and Sheep Creek camps have been the most productive and are described first. Available information concerning some of the other camps and deposits is, in general, less complete.

YMIR CAMP (49° 117° S.E.).

The greater part of the gold production of the Ymir camp has been from quartz veins in a northerly-trending belt east of the Salmo River near the western contact of a part of the Nelson batholith. The rocks in which the veins occur are steeply dipping schistose sediments, having a general strike of a few degrees east of north, and cut by sills of granodiorite, offshoots of the larger mass to the east. The veins occupy north-westward-dipping fault-fissures which strike from north 60° east to east diagonally across the sediments and sills. Faults striking from a few degrees east of north to north-east, generally parallel to the schistosity, cut or terminate the veins, and may be occupied by mineralized veins which so far have not been productive. Within the productive diagonal veins individual ore-shoots tend to follow the intersections of the vein fractures with sills. In addition the ore-zone, or zone of ore-shoots, pitches steeply to the east. Mineralization consists of galena, with which the gold is in many cases associated, pyrite, sphalerite, and in some cases pyrrhotite, in a gangue of quartz. To 1943, veins of this type in the *Ymir, Goodenough, Yankee Girl, Dundee,* and *Centre Star* (*Wesko*) mines have yielded more than 250,000 oz. of gold from about 840,000 tons mined.

References.

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Annual Reports of the Minister of Mines, B.C.

SHEEP CREEK CAMP (49° 117° S.E.).

Gold production from the Sheep Creek camp has been almost exclusively from quartz veins cutting a dominantly quartzitic part of a succession of sedimentary rocks striking north-north-east across the upper part of Sheep Creek. A few miles to the south, west, and north-west, stocks or cupolas of the Nelson batholith, cutting the sediments, are exposed at the surface. The quartz veins occupy fault-fissures which strike north of east diagonally across the bedded rocks. In this camp the veins are vertical or dip steeply southward. In general, ore is found in important quantity only where the veins cut brittle quartzites. Ore-shoots, therefore, tend to follow the intersections of the veins with particularly favourable beds. The productive parts of veins are found cutting dark quartzites, mapped as the Reno formation, and in the upper part of the Quartzite Range formation which consists of white quartzite. The veins, where mined, rarely exceed 5 feet in width and average slightly less than 2 feet wide. In places they branch and two sub-parallel fractures may then contain ore. Ore-shoots range up to several hundred feet in length. The veins have been productive within a comparatively restricted vertical range, between 5,000 and 6,000 feet above sea-level at the northern end of the camp and between 2,500 and 4,000 feet at the southern end. As in the Ymir camp, the veins are mineralized with pyrite, pyrrhotite, galena, and sphalerite, but the average sulphide content is less. Gold is usually associated with the pyrite but, in general, gold values also accompany the sphalerite and galena. Chalcopyrite, bornite, and tungsten minerals are present in some ore-shoots. Production to 1943 from these veins has been 678,220 oz. from slightly over 1,500,000 tons of ore.

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NELSON AREA (49° 117° S.E.).

Within a radius of 8 miles south and west of Nelson there are many gold-bearing veins. Most of this area is underlain by volcanic rocks, now altered to greenstones and chlorite schists, intruded, especially in the northern part, by a number of granitic tongues and satellites of the Nelson batholith. The gold occurs either in quartz-filled fissure veins with more or less clearly defined walls or in shear-zones where the mineralization extends into the walls for some distance from the quartz veins. Veins occur both in the volcanics and in the granitic rocks. In the former they may cut across or conform with the planes of bedding or schistosity of the enclosing rocks. The attitudes of the veins vary widely. Even in a single vein the attitude is not constant, indeed, where it crosses a contact from one type of rock to another the strike and dip may change abruptly, as at the *Athabasca* mine where the vein passes from granite to chlorite schist. Many normal faults, some occupied by lamprophyre dykes, cut the veins and add difficulties to their development. The veins range in width from a few inches to almost 8 feet but are generally narrow. In general only the wider veins constitute ore but in some cases veins as narrow as 1 foot have been mined. In few cases has there been sufficient development and study to determine the structures localizing the ore-shoots. In addition to quartz and gold the mineralization includes pyrite, galena, sphalerite, chalcopyrite, as well as rarer sulphantimonides and oxidized ore minerals. The gold production of the camp, mainly from the *Granite-Poorman* and *Athabasca* mines, has totalled over 75,000 oz. from 175,000 tons mined up to 1942.

This has been represented on the map accompanying Part I. by two symbols—one centring on Toad Mountain, the other on Hall Creek.

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Annual Reports of the Minister of Mines, B.C.

DOMINION MOUNTAIN (49° 117° S.E.).

Another group of properties occurs on Dominion Mountain, 7 miles north-west of Ymir, those of its western slope being accessible by way of Erie Creek and those of its eastern slope by way of Barrett Creek. All but one of these properties lie within a belt of volcanic rocks, now greenstones and green schists, containing minor amounts of intercalated sediments. Within 2 miles to the north-west and west of this area of volcanics is a large body of granitic rock, another part of the Nelson batholith. The most important gold-bearing quartz veins, those of the *Second Relief* and *Porto Rico* mines, strike north-easterly and dip north-westward at moderate to high angles. In both mines the main veins, for considerable parts of their lengths, follow the walls of dykes—in the former a dyke of diorite porphyry and in the latter of lamprophyre. The influence of wall-rocks is important. Where the veins follow the dykes through brittle greenstones they are wider or richer than in less competent volcanics or the slates. The widths of the veins vary from a few inches to almost 15 feet, but where mined average about 2 feet. Almost the full length of the *Second Relief* vein, over 1,000 feet, has been mineable. Mineralization includes pyrite, pyrrhotite, chalcopyrite, and gold. Production from this area, mainly from the *Second Relief* mine, has exceeded 103,000 oz. of gold from slightly less than 250,000 tons of ore mined.

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Annual Reports of the Minister of Mines, B.C.

KEYSTONE (MINERAL) MOUNTAIN (49° 117° S.E.).

On Keystone (Mineral) Mountain, about 3 miles north of the town of Salmo, several gold-producing properties, notably the *Arlington*, *Keystone*, and *Clubine-Comstock* mines, are situated in the southward continuation of the belt of volcanics of the Nelson and Dominion Mountain areas. In this locality there is a considerable proportion of sediments associated with the volcanic rocks. A large granodiorite intrusive extends eastward from the eastern slopes of Keystone Mountain. The gold occurs in quartz veins occupying fissures or shears in the sediments and volcanics. The productive veins of this area have diverse strikes but all have low dips. The most important vein follows a granite sill, another productive vein follows the foot-wall of a lamprophyre dyke. Mineralization consists of quartz, pyrite, gold, some galena and sphalerite, and occasionally chalcopyrite. Production, mainly from the *Arlington* mine, has amounted to over 53,000 oz. of gold from 29,000 tons of ore mined. Most of this ore has been mined selectively and shipped to Trail to be smelted.

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Annual Reports of the Minister of Mines, B.C.

BAYONNE AREA (49° 116° S.W.).

The gold deposits of the Bayonne area, which lies from 5 to 7 miles east of the Sheep Creek camp, occur within two granodiorite or quartz-diorite stocks. The gold occurs in quartz veins which have a north-easterly to easterly strike and high dips to the south. Vein-widths rarely exceed 3 feet. Mineralization consists of quartz with pyrite, galena and sphalerite. Lenses of almost pure galena occurring within the veins carry moderate values in silver but very little gold. Production, mainly from the *Bayonne* mine, has amounted to over 40,000 oz. of gold from about 84,000 tons of ore mined.

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Annual Reports of the Minister of Mines, B.C.

SITKUM CREEK AREA (49° 117° N.E.).

At the head of Sitkum Creek, 13 miles north of Nelson, there are a number of gold prospects of which one, the *Alpine*, came into production within the last five years. Gold from this deposit occurs in a quartz vein striking east-north-east, dipping at low angles to the north and cutting granite of the Nelson batholith. The vein is lenticular, ranging in width up to at least 7 feet. Mineralization includes pyrite and a small amount of galena and sphalerite. Production has amounted to about 10,000 oz. of gold from 20,000 tons of ore mined.

REFERENCE.

MACONACHIE, R. J. (1938): Alpine Gold Co., Ltd.—*Minister of Mines, B.C.*, Ann. Rept., pp. E 13–E 15.

MISCELLANEOUS DEPOSITS (49° 117° S.E.).

In recent years very minor amounts of gold ore have been shipped from properties in the western and southern parts of the Salmo area. Of those near the upper part of Beaver Creek and west of the Salmo River there is little information available. About 100 oz. of gold have been produced from the Rosebud Lake area, east of Salmo River, from quartz veins following shears in schists, argillites, and limestones.

Several thousand ounces of gold have been produced at the *Durango* (*Howard*) mine, 5 miles south-east of Ymir, from a northerly-striking replacement fissure-vein cutting quartzites and granite, and containing pyrrhotite, pyrite, sphalerite, galena, and quartz.

A small amount of gold has been produced from granitic areas not treated elsewhere, notably from the area a few miles north-east of Ymir on Ymir Creek. The gold in these deposits occurs in quartz veins of various attitudes mineralized with pyrite, pyrrhotite, galena, and sphalerite. Total production from these sources has amounted to about 9,000 oz. from about 19,000 tons of ore mined. On the map accompanying Part I. nearly all this production is included with the Ymir camp.

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Annual Reports of the Minister of Mines, B.C.

CONTACT METAMORPHIC DEPOSITS.

A small number of contact metamorphic deposits in limestones exist throughout the Nelson Mining Division. In the majority of these lead and zinc contribute the principal value of the ore and gold is of minor importance. From these deposits slightly more than 1,000 oz. of gold have been produced as a by-product of the mining of over 100,000 tons of ore.

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Annual Reports of the Minister of Mines, B.C.

SLOCAN MINING DIVISION.

The Slocan Mining Division now includes the areas formerly known as Slocan, Slocan City, and Arrow Lakes Mining Divisions.

History.—Prospecting in the Slocan area began with the discovery of the lead-zinc lodes of Payne Mountain in 1891. The search for more lodes was rapidly extended and in 1893 the gold deposits of Lemon and Springer Creeks were discovered. The silver-gold deposits of Carpenter Creek were located at about this same time. From 1895 on, a small gold production has been maintained, a considerable part of it as a by-product of lead, zinc, and silver mining.

LEMON CREEK-SPRINGER CREEK AREA (49° 117° N.E.).

In the south-eastern part of the Slocan Mining Division, a few miles from Slocan City, in the drainage basins of Lemon and Springer Creeks, gold-bearing quartz veins cut granite of the Nelson batholith. These veins have widely varying strikes, many of them have low dips, and their widths range from a few inches to about 4 feet. In many cases they are interrupted by post-vein faults. The mineralization includes pyrite, pyrrhotite, chalcopyrite, arsenopyrite, galena, sphalerite, tetrahedrite, and, in some cases, native silver and silver sulphantimonides. The gold is generally associated with pyrite or arsenopyrite in rusty or rose-coloured quartz. In the southern part of the area and at the head of Sitkum Creek in the adjacent Nelson Mining Division gold values average about 0.4 oz. per ton. On the northern side of Springer Creek silver values predominate and gold is generally a by-product. The production from this area between 1895 and 1943 amounted to about 2,750 oz. of gold.

AYLWIN CREEK AREA (49° 117° N.E.).

Gold deposits, notably the *L.H.* and *Little Daisy*, similar in character to those of the Slocan City area are found in a small roof pendant area near Aylwin Creek, north

of Enterprise Creek. Between 1904 and 1943, 250 tons of ore mined from these deposits yielded about 200 oz. of gold.

CARPENTER CREEK AREA (49° 117° N.E., 50° 117° S.E.).

In the part of the Slocan silver-lead-zinc camp near New Denver and Three Forks several deposits contain values in both silver and gold. These deposits consist of veins of quartz with some calcite and siderite cutting either a granitic stock situated northeast of New Denver, or sediments. The veins vary widely in the attitude, range from a few inches to about 4 feet in thickness, and are mineralized with pyrite, galena, sphalerite, and silver minerals. Production, mainly from the *Molly Hughes* and the *Monitor* and *Ajax* mines, since 1896 has amounted to about 2,000 oz. of gold from about 9,000 tons mined.

Other production from the Slocan silver-lead-zinc camp has amounted to about 2,000 oz. of gold as a by-product of the mining of lodes whose values are essentially in lead, silver, and zinc.

ARROW LAKES AREA (50° 117° S.W., 50° 118° S.E.).

A total of 357 oz. of gold has been recovered from the Arrow Lakes area, from the *Millie Mack* and *Chieftain* properties on Caribou Creek, east of Burton, and from the *Paladora* mine near the head of Fire Valley, west of the Arrow Lakes. Very little information is available on these properties.

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AINSWORTH MINING DIVISION (50° 117°).

Only two localities in the Ainsworth Mining Division have produced gold, except as a by-product of silver-lead-zinc mining. Near the head of Woodbury Creek, northwest of Ainsworth, quartz veins yielded about 250 oz. of gold in the period from 1898 to 1906. The veins cut the Nelson batholith and contain pyrite, galena, and sphalerite. Difficulties in transportation evidently led to the abandonment of these properties. The *Highland Surprise* mine, near the head of Lyle Creek, has produced in the period from 1938 to 1941 more than 1,500 oz. of gold from north-westerly-striking, steeply dipping vein-zones cutting schistose volcanics adjacent to a serpentine body. The veins are composed of quartz with pyrite, chalcopyrite, and small amounts of galena and sphalerite. High-grade shoots may occur along the intersections of the vein-zones with cross-fractures. Since 1893 lead and zinc mines on upper Kaslo Creek have produced almost 1,500 oz. of gold as a by-product.

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LARDEAU MINING DIVISION (50° 117° N.).

Although some prospecting was carried out in the Lardeau area as early as 1865, it was not until the early '90's, after the subsidence of the gold-rushes to French and McCulloch Creeks, 100 miles farther north, that a careful study of this area was made. Attention was first focused on the area north-east of Trout Lake and soon led to the discovery of the lead-silver-gold deposits of Silver Cup Mountain and Ferguson. In 1899 the gold ores of Camborne were discovered and a rush followed. By 1904 several properties in this area came into production, but the operations were unsuccessful and in 1909 all were closed down. Since then, however, two properties in the Camborne area have been worked and more than 9,000 oz. of gold extracted. During the past fifty years intermittent operations at several properties in the Ferguson-Silver Cup Mountain area yielded more than 6,000 oz. of gold, in addition to silver, lead, and zinc. Rich pockets of gold were found in the vicinity of Poplar Creek in 1903, but the deposits proved to be very small and a very minor production resulted.

Economic Geology.—Virtually all the lode-gold production of the Lardeau area has come from the so-called Central Mineral Belt—about 45 miles long and rarely over 2 miles wide, extending north-westerly from Poplar Creek to the Incomappleux River along the strike of folded sediments. Within this belt the gold production has come principally from two areas—one in the vicinity of Camborne, the other on Silver Cup Mountain. Some of this gold has been produced as a by-product of silver and lead mining.

The gold deposits of the Camborne area occur in fissure-veins and lodes, usually having south-westerly strikes and steep dips, cutting argillaceous and graphitic schists and carbonatized greenstone dykes. In some cases some replacement and mineralization has taken place in the vein-walls. The veins may be very persistent, with widths varying from a few inches to about 20 feet. Ore-shoots are in some cases localized at intersections with cross-veins. Mineralization consists of pyrite, galena, and sphalerite in a gangue of quartz with some ankerite and siderite. Production has amounted to 18,254 oz. of gold from 100,804 tons mined.

As in the Camborne area, the gold of Silver Cup Mountain and Ferguson occurs in quartz fissure-veins and lodes of varying strikes and dips, cutting argillaceous and graphitic sediments and carbonatized greenstone dykes. Some wall-rock replacement has been noted. Mineralization includes galena and sphalerite, tetrahedrite, and some chalcopyrite with the main values in silver and lead. Production has amounted to 7,224 oz. of gold from 46,489 tons mined.

The gold in the Poplar Creek area occurs in quartz veins cutting argillaceous and graphitic schists and carbonatized greenstone dykes. Mineralization includes pyrite, arsenopyrite, some galena, sphalerite, and chalcopyrite. High-grade pockets are said to occur at some vein intersections. Production has amounted to less than 100 oz. of gold.

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REVELSTOKE MINING DIVISION (51° 117°, 51° 118°).

Lode-gold production of the Revelstoke Mining Division has amounted to about 20 oz., all of it a by-product of the mining of lead and silver. On the upper part of McCulloch Creek, the scene of a placer-gold rush in 1865, several gold-bearing quartz veins were staked, including the *Ole Bull* and *Orphan Boy* claims. Several other gold prospects on the western slope of the Selkirk Mountains have also been staked, but in no case has any gold production been recorded.

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GOLDEN MINING DIVISION (50° 116°, 51° 117°).

Lode gold produced in the Golden Mining Division up to 1943 has amounted to about 140 oz., all as a by-product of the mining of lead and silver. In a few prospects in the upper Spillimacheen area gold values are sufficiently high to attract interest, but these lie in relatively inaccessible parts of the Purcell Mountains.

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FORT STEELE MINING DIVISION (49° 115°, 49° 116°).

The recorded production of gold between 1907 and 1940 from lode deposits in the Fort Steele Mining Division amounted to about 2,500 oz., of which 80 per cent. was a by-product of the zinc and lead recovery from the tailings of the *St. Eugene* mine at Moyie. The remaining production has been from quartz veins cutting argillites and quartzites and containing pyrite, chalcopyrite, galena, and sphalerite in several localities in the mining division.

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PROSPECTING POSSIBILITIES.

In a summary of the lode-gold prospecting possibilities of South-eastern British Columbia several points should be made clear. The gold production to date has been almost entirely from areas in which ore deposits were exposed at the surface. With a few important exceptions the deposits were discovered during the intensive prospecting at the end of the last century. In these areas, therefore, it is probable that most of the surface showings have been thoroughly examined several times during the past fifty years. Moreover, in these camps much of the ground is still held either by location or by Crown grant, but some claims have reverted to the Crown. The increased price for gold, improvements in mining and milling techniques, and skilful search for ore have given some properties, once abandoned, a new lease of life. Careful study of the ground and of available information, followed by drilling or other exploratory work, beyond the capacity of the individual prospector, may well lead to the discovery of hidden ore-bodies.

In parts of the Ainsworth and Slocan Mining Divisions and in some other areas numerous silver-lead-zinc ore deposits have been found, indicating that these sections have been prospected carefully. Gold contributes small but appreciable values to silver-lead-zinc deposits in parts of the Slocan-Ainsworth area. On the outskirts of the silver-lead-zinc areas, generally in or approaching granitic bodies, deposits essentially barren of lead-zinc values carry important values in gold. It may be that prospecting in or near these or similar sections will reveal the presence of other lode-gold deposits.

Prospecting over much of the East Kootenay area, especially in the Golden Mining Division, has disclosed silver, lead, and zinc deposits, but gold is scarce or absent.

Areas between the gold-producing camps of the Nelson, Slocan, and Trail Creek Mining Divisions may be geologically favourable and have not been as intensively prospected as the camps themselves. Such areas can, therefore, be recommended for gold-prospecting. The prospector in his search should pay special attention to the structures and host-rocks which have proved favourable in the near-by productive camps.

More remote areas, principally in the Revelstoke, Slocan, Golden, and Fort Steele Mining Divisions, which have not been prospected closely may be favourable for the occurrence of lode-gold deposits. Areas recently made more readily accessible by construction of roads, such as the Big Bend Highway and the road to the *Bayonne* mine, should be considered. However, except in the vicinity of Fort Steele, neither placer nor lode gold has been found in the area east of the Rocky Mountain trench, and this area cannot be recommended to individuals prospecting for lode-gold deposits.

The presence of placer gold suggests the possibility of lode-gold sources. Although placer gold has been known in certain areas for a very long time, the fact that economic lode-gold sources have not been discovered does not entirely eliminate the possibility that lode-gold sources might still be found. Areas near the sources of placer-bearing creeks may, therefore, be worthy of prospecting. Most of the placer gold from Revelstoke Mining Division has been recovered from French Creek and McCulloch Creek; some placer gold has also been recovered from Camp Creek. The three creeks are southerly-flowing tributaries of Goldstream. Some placer gold has been recovered from the east side of Columbia River, up-river from Goldstream. Some lode-gold prospects have been located in the area drained by the streams mentioned. Downie Creek and Carnes Creek in the Revelstoke Mining Division also yielded some placer gold. Completion of the Big Bend Highway has made this area more accessible and therefore more attractive for prospecting.

Placer gold has been recovered near Whatahan Lake in Slocan Mining Division, from Quartz and Ptarmigan Creeks in Golden Mining Division, and in Fort Steele Mining Division from Wildhorse Creek and west of Cranbrook between St. Mary and Moyie Rivers from tributaries of both rivers. Placer gold recovered in small quantity from other streams generally can be attributed to areas known to contain lode-gold deposits.

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